OPERATING INSTRUCTIONS

TYPE 1208-B

UNIT OSCILLATOR

OFFICIAL RECORDS STATION
FACILITIES

GENERAL RADIO COMPANY

G

OPERATING INSTRUCTIONS

TYPE 1208-B

UNIT OSCILLATOR

Form 1208-0100-G
March, 1962

GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS, USA

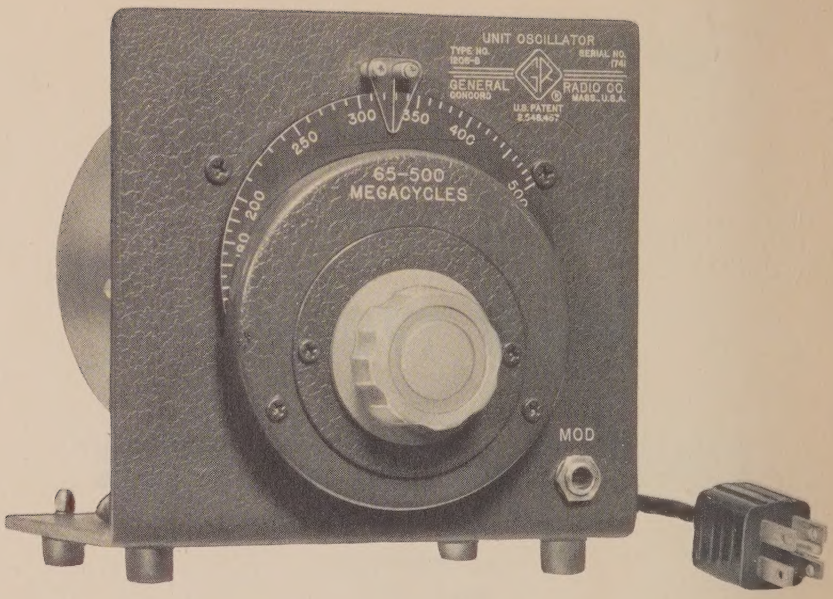


Figure 1.
Panel View, Type 1208-B Unit Oscillator

SPECIFICATIONS

Frequency Range: 65 to 500 Mc.

Tuned Circuit: Sliding-contact type.

Frequency Control: 4-in. dial calibrated over 270 deg. Slow-motion drive, 4½ turns.

Frequency Calibration Accuracy: ±2%.

Warm-up Frequency Drift: 0.5%.

Output System: Short coaxial line, with coupling loop on one end, Type 874 coaxial connector on other. Coupling between loop and oscillator adjustable over wide range; loop can be clamped in any position. Max power can be delivered to load impedances normally met in coaxial systems.

Output Power: At least 200 mw into 50 ohms, except at very highest frequencies; 500 mw in center of range. See Figure 7.

Modulation: 30% amplitude modulation at audio frequencies can be produced by an external source of 40 v. Input impedance about 8000 ohms. Type 1000-P6 Crystal Diode Modulator or Type 1000-P7 Balanced Modulator can be used.

Power Supply Requirements: 320 v at 40 ma. 6.3 v at 0.9 amp. Refer to table, paragraph 1.3, for recommended power supplies.

Oscillator Tube: Lighthouse Type 2C43 or the GE long-life version, Type Z5033.

Mounting: Aluminum casting surrounded by spun-aluminum container. Assembly mounted on L-shaped panel-and-chassis piece.

Accessories Supplied: Type 874-R22 Cable, 874-C58 Cable Connector, and telephone plug.

Accessories Available: Refer to table, paragraph 1.3.

Dimensions: Height 6¼, width 6¼, depth 8¼ inches (160 by 160 by 210 mm) overall.

U. S. Patent No. 2,548,457

Weight: 5½ lb (2.5 kg).

TYPE 1208-B
UNIT OSCILLATOR

Section 1
INTRODUCTION

1.1 PURPOSE. The Type 1208-B Unit Oscillator (Figure 1) is a general-purpose power source for the radio-frequency laboratory. Covering the range from 65 to 500 Mc, this member of the convenient Unit Instrument line can be used to drive bridges, slotted lines, impedance comparators, and other measuring equipment. Used with a voltmeter and attenuator, it provides an accurately known output voltage for the testing of receivers. Direct amplitude modulation is possible over the audio-frequency range, and amplitude modulation free from incidental fm can be obtained with a simple crystal-diode modulator over the frequency range from zero to 5 Mc. Connected to a mixer, the Unit Oscillator can be used as the local oscillator in a heterodyne receiver to convert a Type 1216-A Unit I-F Amplifier or a low-frequency communications receiver into a detector for v-h-f and u-h-f signals. Pulsing and linear 100-percent amplitude modulation can be obtained with an external balanced modulator.

1.2 DESCRIPTION. The tuning system of the Type 1208-B Unit Oscillator is a "contact-type" circuit, which combines a variable air capacitor and a variable inductor in a single unit. Inductance varies from 0.06 μh at the low-frequency end to 0.01 μh at the high-frequency end, and capacitance varies from 100 μμf to 8 μμf. Rotor and stator plates are shaped so that frequency varies logarithmically with dial rotation. The vernier dial requires about 4-1/2 turns to rotate the main dial over its full 270 degrees. The frequency calibration is accurate within 2 percent.

Plate and grid of the Type 2C43 Lighthouse oscillator tube are connected to the tuned circuit, and the cathode shell is grounded. The oscillator circuit is of the Colpitts type, with feedback determined by the electrode capacitances of the tube.

The output system is a short coaxial line, with a coupling loop on one end and a Type 874 Coaxial Connector on the other. Coupling between the loop and the oscillator can be adjusted over a wide range, and the loop can be clamped in the desired position. Maximum power can be delivered to load impedances normally encountered in coaxial systems.

1.3 ACCESSORIES. The following table lists accessories recommended for use with the Type 1208-B Unit Oscillator.

TABLE OF ACCESSORIES

Accessory and Function	Instrument	Remarks
POWER SUPPLIES		
Standard	Type 1203-B Unit Power Supply	115-v, 50-60-cps line
Stabilized Plate Voltage	Type 1201-B Unit Regulated Power Supply	105-125 v, 50-60 cps Output reduced to 100 mw.
Adjustable Plate Voltage	Type 1205-B Adjustable Regulated Power Supply	115-v, 60-cps line
MODULATORS		
Plate Modulation	Type 1214-A Unit Oscillator	400 and 1000 cps output, 115-v, 40-60-cps line
Absorption Modulation with no Incidental FM	Type 1000-P6 Crystal-Diode Modulator	Requires modulation source. Max output 10 mv.
Balanced Modulation for linear 100-percent amplitude modulation and for pulses with high degree of carrier suppression	Type 1000-P7 Balanced Modulator	Requires modulation source. Modulation frequency range 0-20 Mc. Max output 10 mv.
SWEEP DRIVE		
Automatic Frequency Sweep	Type 908-P1 Synchronous Dial Drive Type 907-R Dial Drive Type 1750-A Sweep Drive	For limited use at slow speeds only.*
RELAY RACK PANEL	Type 480-P4UC2	For Types 1203-B and 1208-B or for 1201-B and 1208-B
ADAPTORS - available for connecting Type 874 coaxial output terminals to Types N, BNC, C, UHF, and HN coaxial systems.		

*Since sliding contacts are used in the tuning unit, the Type 1750-A Sweep Drive should be connected to the vernier drive only, and not to the main dial. This restricts the possible sweep to about 20% in frequency. Sweep rate should be restricted to one excursion per second.

Section 2

OPERATING PROCEDURE

2.1 INSTALLATION. The Type 1208-B Unit Oscillator is shipped complete with tube installed, and is ready for use when connected to a suitable power supply. A cord with connector is permanently attached for direct connection to General Radio Unit Power Supplies. Connect the oscillator to the equipment under test by means of the three-foot coaxial cable supplied. If necessary, install one of the two connectors supplied on the equipment under test; or use one of the many adaptors available for various coaxial systems.

If a power supply other than a General Radio Unit Power Supply is used, it should be capable of supplying 320 volts at 40 milliamperes and 6.3 volts at 0.9 ampere. Readjustment of the variable grid resistor and the series plate resistors may be required to obtain maximum output and to prevent overloading of the oscillator tube. The grid resistor, on the oscillator base casting, is accessible when the shield is removed. (To remove the shield, loosen the clamp screw and remove the two screws near the top of the shield.) The series plate resistors are inside the base casting, and their terminals project through the side of the base. The three terminals may or may not be shorted, depending on the characteristics of the oscillator tube. (See Figure 5.)

The maximum allowable plate current is 36 milliamperes, and the maximum plate dissipation is 10 watts. For maximum output, the tube should operate near maximum plate current. Plate current is adjusted by means of the grid resistor R3. It will be found that maximum plate current is obtained under no load near the top end of the frequency range. With a fixed power supply with an output voltage over 275 volts at 36 milliamperes, plate series resistance (2000, 3500, or 5500 ohms) may be required to limit plate dissipation or to allow operation with a lower grid resistor R3 to prevent motorboating.

2.2 OPERATION. After turning on the power supply, adjust the frequency by means of the frequency dial, and adjust the output by rotating the output coupling loop. For low output the coupling loop can be partly withdrawn.

For amplitude modulation the audio modulating voltage should be inserted at the MODULATION jack on the front panel. Full plate current must flow through the modulating source. A modulation voltage of about 40 volts is required for 30-percent modulation. The input impedance is about 8000 ohms.

2.3 FREQUENCY DEVIATION. For some applications a well-regulated and filtered power supply should be used to avoid frequency variations caused by line-voltage fluctuation and to produce a clearer beat note. A line-voltage variation of about 20 percent causes a frequency change of about 0.01 percent at frequencies up to 300 Mc, 0.1 percent at 400 Mc, and 0.5 percent at the top end of the frequency range.

Amplitude modulation over the audio range can be obtained by audio-frequency voltage superimposed in the dc power supply. Convenient terminals are provided for this purpose. Incidental fm, inherent in this system, is about 0.01 percent for 30-percent amplitude modulation at carrier frequencies up to 300 Mc, and increases rapidly at the high-frequency end.

Section 3
APPLICATIONS

3.1 GENERAL. The utility and versatility of the Type 1208-B Unit Oscillator are greatly increased by the large selection of Type 874 coaxial elements available from General Radio Company. These elements are part of a complete, integrated line of equipment for the measurement of voltage, power, and standing-wave ratio at very-high and ultra-high frequencies. Although the Unit Oscillator is intended primarily as a source of power for this measuring equipment and for other impedance measuring devices such as the Type 1602 UHF Admittance Meter, use of the coaxial elements can adapt the Unit Oscillator to various applications in the radio-frequency laboratory. For sweep applications the Type 1208-B can be driven by the General Radio Type 1750-A Sweep Drive. It is recommended, however, that the oscillator be swept only during actual observations and at slow speeds only. When the Type 1208-B Unit Oscillator is mechanically swept, all moving parts must be well lubricated. Refer to paragraph 4.3.

Three applications are described in detail in the following paragraphs. Others will be suggested by a study of the complete list of Type 874 coaxial elements, included in the General Radio Catalog.

3.2 UNIT OSCILLATOR AS SIGNAL GENERATOR FOR RECEIVER TESTING. The Type 1208-B, as a well-shielded power source, can be used as a signal generator to test receivers if means are available to measure and attenuate the output. The Type 874-VR Voltmeter Rectifier, Type 874-VI Voltmeter Indicator, and Type 874-GA Adjustable Attenuator are suitable for this purpose, and should be connected to the Unit Oscillator as shown in Figure 2. Also, a Type 874-D50 Adjustable Stub is required at the higher frequencies (from 300 Mc up) to produce a current maximum at that point of the attenuator where the adjustable output loop is coupled. At lower frequencies a Type 874-WN Short-Cir-

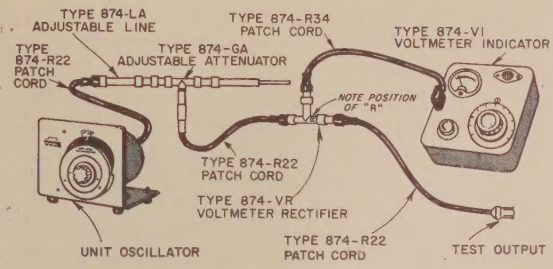


Figure 2. Unit Oscillator, with Accessories, Set Up as Standard-Signal Generator.

cuit Termination can be used for this purpose. A tuning element between the oscillator and the attenuator is required to increase the output to a value that can be read on the voltmeter. At higher frequencies coverage is obtained by a Type 874-LA Adjustable Line. At lower frequencies additional lengths of line must be used.

Current from the Unit Oscillator is fed through the attenuator into the short circuit or the stub. The attenuator is calibrated in decibels. At minimum attenuation the attenuator output is measured by a crystal diode in the voltmeter rectifier and read on the meter of the voltmeter indicator. Means are provided to standardize the crystal indication. A 50-ohm resistor after the crystal determines the output impedance.

With the above-described arrangement, the maximum available output is several tenths of a volt. The attenuator calibration covers 120 db, but shielding of the Unit Oscillator and of other components is not sufficient for accurate measurements in the microvolt region.

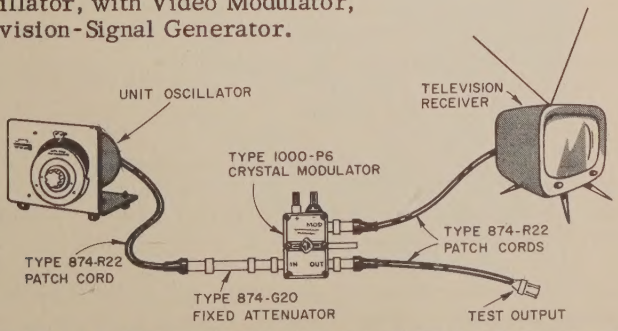
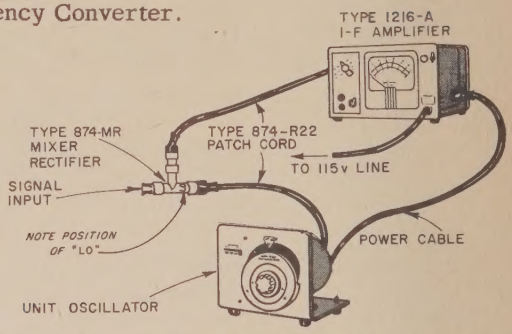


Figure 3. Unit Oscillator, with Video Modulator, Set Up as Television-Signal Generator.

3.3 UNIT OSCILLATOR AS A TELEVISION-SIGNAL GENERATOR. Used in combination with a Type 1000-P6 Crystal Diode Modulator and a Type 874-G20, 20-db Fixed Attenuator, the Unit Oscillator is a convenient source of television signals over its entire carrier-frequency range if video modulating voltage is available. (See Figure 3.) The modulating

Figure 4.
Unit Oscillator, with Mixer Rectifier, Set Up as Frequency Converter.



voltage required can be obtained from a standard television receiver tuned to a local channel. Since the modulator and oscillator are separated from each other by an attenuator pad, amplitude modulation is free from incidental fm. Output is about 10 millivolts.

3.4 UNIT OSCILLATOR AS A FREQUENCY CONVERTER. Connected to a Type 874-MR Mixer Rectifier, the Unit Oscillator can provide the local signal in a heterodyne converter to adapt the Type 1216-A Unit I-F Amplifier for use as a sensitive detector for v-h-f and u-h-f signals. (See Figure 4.) Without additional tuning, the conversion loss is about 6 db at an intermediate frequency of 30 Mc.

Section 4

SERVICE AND MAINTENANCE

4.1 GENERAL. The two-year warranty given with every General Radio instrument attests the quality of materials and workmanship in our products. When difficulties do occur, our service engineers will assist in any way possible.

In case of difficulties that cannot be eliminated by the use of these service instructions, please write or phone our Service Department, giving full information of the trouble and of steps taken to remedy it. Be sure to mention the serial and type numbers of the instrument.

Before returning an instrument to General Radio for service, please write to our Service Department or nearest district office (see back cover), requesting a Returned Material Tag. Use of this tag will ensure proper handling and identification. For instruments not covered by the

warranty, a purchase order should be forwarded to avoid unnecessary delay.

4.2 TUBE REPLACEMENT. The 2C43 lighthouse-type oscillator tube supplied with new oscillators will be found satisfactory for most uses. For special applications this tube can be replaced by the more expensive long-life version, the General Electric Type Z5033.

4.3 READJUSTMENTS. If the oscillator tube is replaced, grid and plate resistors may require readjustment (refer to paragraph 2.1) to obtain maximum output and to limit plate current and plate dissipation. Replacement of the oscillator tube may also affect frequency calibration. It can be restored by adjustment of the flexible tab on the plate connector. Before adjusting this trimmer capacitor, allow the instrument to warm up, since warm-up drift may be as much as 0.5 percent. The oscillator shield affects frequency considerably, especially at the low-frequency end.

4.4 CLEANING AND LUBRICATION. If, after some time, frequency can no longer be adjusted smoothly, clean the spring fingers and the contact surfaces on rotor and stator with carbon tetrachloride, and apply a thin film of light lubrication (Aero Lubriplate MD).

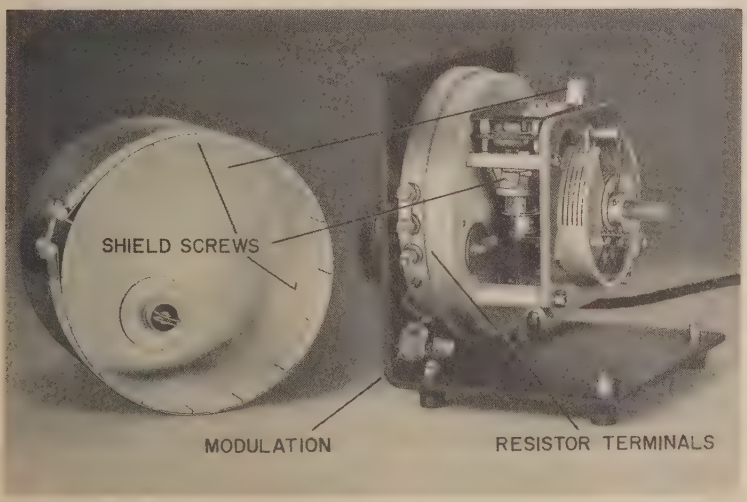


Figure 5. Unit Oscillator, with Cover Removed, Showing Tuned Circuit and Output Coupling Loop (in cover).

Section 5
PARTS LIST

RESISTORS (NOTE B)	R1	100	± 5%, 1/2 w	REC-20BF
	R2	1 k	± 5%, 1/2 w	REC-20BF
	R3	5 k	±10%	POSW-3
	R4	1 k	± 5%, 1/2 w	REC-20BF
	R5	2 k	± 5%	REPO-42
	R6	3.5 k	±10%	REPO-20P
	R7	22	±10%, 1/2 w	REC-20BF
CAPACITORS (NOTE C)	C1	Built into V1		
	C2	200, built in, mica		
	C3	200, built in, mica		
	C4	Built in, air trimmer		
	C5	20, built in, air		
	C6	200, built in, mica		
	C7	200, built in, mica		
	C8	200, built in, mica		
	C9	Built in, air		
MISCELLANEOUS	J1	Jack, signal		CDSJ-10
	L1	Inductor, 1.75 μh		ZCHA-17
	L2	Inductor, 1.75 μh		ZCHA-17
	L3	Inductor, 45 μh		ZCHA-9
	L4	Inductor (r-f pickup loop)		Part of 874-402
	L5	Inductor, 92 μh		ZCHA-36
	L6	Inductor, 45 μh		ZCHA-9
	LC1	Butterfly tuning unit		
	PL1	Plug		1208-0430

NOTES

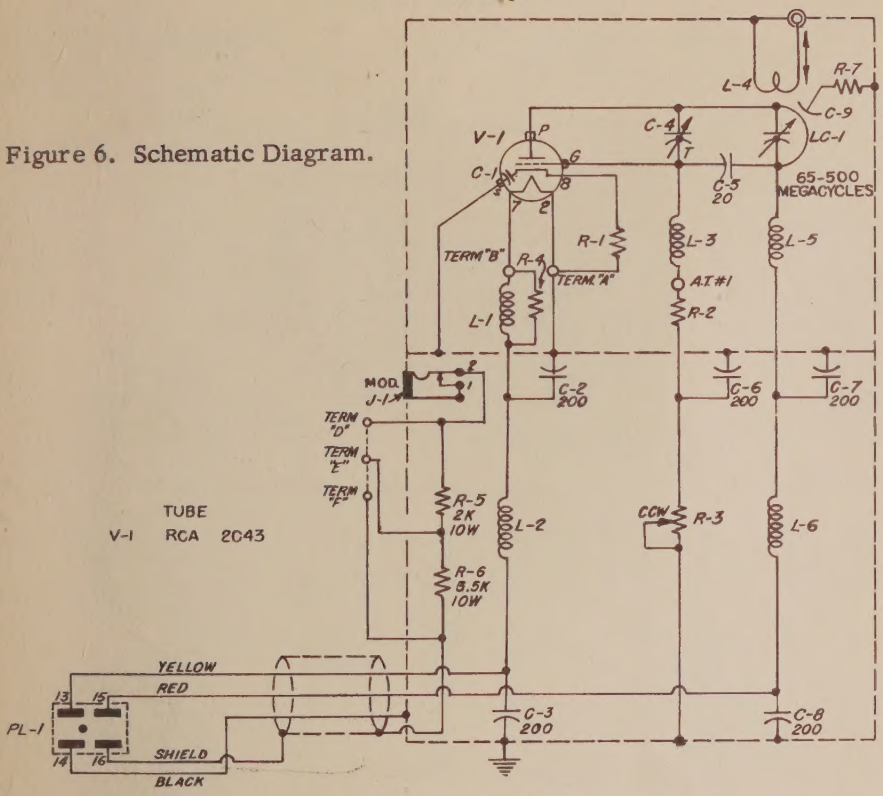
(A) Resistor type designations as follows:

POSW - Potentiometer, wire-wound
REC - Resistor, fixed, composition
REPO - Resistor, fixed, power

(B) All resistances in ohms, except as otherwise indicated by k (kilohms)

(C) All capacitances are in micro-microfarads, and are approximate.

Figure 6. Schematic Diagram.



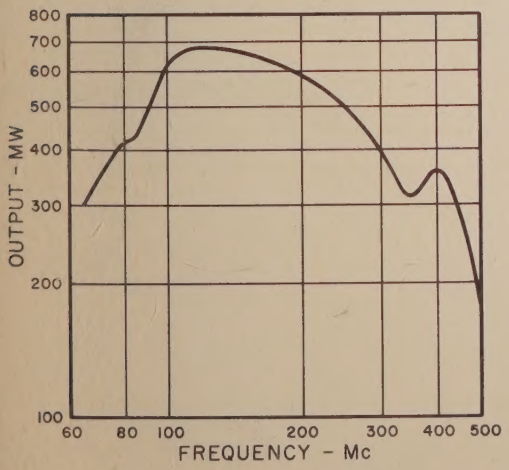


Figure 7. Typical Output with Type 1203-B Unit Power Supply. (With 300-volt Type 1201-B Unit Regulated Power Supply output is reduced to about 0.5 of values shown.)

TYPE 874 COAXIAL COMPONENTS

TYPE 874- CONNECTORS

CONNECTOR TYPE	CABLE TYPE: 874-A2	874-A3 RG-29/U RG-55/U RG-58/U RG-58A/U	RG-8/U	RG-9/U RG-116/U	RG-59/U RG-116/U
CABLE	-C	-C58	-C8	-C9	-C62
CABLE LOCKING	-CL	-CL58	-CL8	-CL9	-CL62
PANEL	-P	-P58	-P8	-P8	-P62
PANEL, FLANGED	-PB	-PB58	-PB8	-PB8	-PB62
PANEL, LOCKING	-PL	-PL58	-PL8	-PL8	-PL62
PANEL, LOCKING RECESSED	-PRL	-PRL58	-PRL8	-PRL8	-PRL62

Example: For a locking cable connector for RG-8/U, order Type 874-CL8.

TYPE 874- ADAPTORS

TO TYPE		874-	TO TYPE		874-
BNC	plug	QBJA QBJL*	TNC	plug	QTNJ QTNJL*
	jack	QBPA		jack	QTNP
C	plug	QCJA QCJL*	UHF	plug	QUJ QUJL*
	jack	QCP		jack	QUP
HN	plug	QHJA	UHF	7/8-in.	QU1A
	jack	QHPA	Air	1-5/8-in.	QU2
LC	plug	QLJA QLPA	Line	3-1/8-in.	QU3A
LT	plug	QLTJ			
	jack	QLTP			
N	plug	QNJA QNJL*			
	jack	QNP			
SC	plug	QSCJ QSCJL*			
	jack	QSCP			

*Locking Type 874 Connector.

Example: To connect Type 874 to a Type N jack, order Type 874-QNP.

OTHER COAXIAL ELEMENTS

Type 874-	
A2	50 Ω cable (low loss)
A3	50 Ω cable
D20, D50	20-, 50-cm adjustable stubs
EL	90° ell
F185	185-Mc low-pass filter
F500	500-Mc low-pass filter
F1000	1000-Mc low-pass filter
F2000	2000-Mc low-pass filter
F4000	4000-Mc low-pass filter
G3, G6 G10, G20	3-, 6-, 10-, & 20-db attenuators
GA	adjustable attenuator
JR	rotary joint
K	coupling capacitor
L10, L20, L30	10-, 20-, & 30-cm rigid air lines
LA	33-58 cm adjustable line
LK10, LK20	constant-Z adjustable lines
LR	radiating line
LT	trombone constant-Z line
M	component mount
MB	coupling probe
MR	mixer-rectifier
T	tee
UB	balun
VC	variable capacitor
VI	voltmeter indicator
VQ	voltmeter detector
VR	voltmeter rectifier
W100	100-Ω termination
W200	200-Ω termination
WM	50-Ω termination
WN, WN3	short-circuit terminations
WO, WO3	open-circuit terminations
X	insertion unit
Y	cliplock
Z	stand

The above is a partial listing. For complete details, refer to the General Radio catalog.

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